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West Europe Report

SCIENCE AND TECHNOLOGY

No. 62

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WEST EUROPE REPORT

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CONTENTS

BIOTHECHNOLOGY OFFICE CREATED TO PROMOTE R&D, APPLICATION

Paris LE MATIN in French 4/5 Apr 81 p 15

[Article by Robert Clarke: "A 'Biotechnology' Task Force Created at the Delegation for Research"]

> [Text] Provided with a budget of Fr 45 million, it will serve to develop basic research and facilitate industrial applications. A "biotechnology" task force has just been created at the General Delegation for Scientific and Technical Research [DGRST]. Provided with a sizable budget--Fr 45 million for 1981--this task force has the goal of accelerating the implementation of programs intended to develop the industry of living things, from basic research to applications.

Provided for in measures enacted last February by the Council of Ministers, the "biotechnology" task force is being set up at DGRST, the General Delegation for Scientific and Technical Research, through the efforts of Prof. Pierre Douzou, adviser for biological and medical research.

As described today by Claude Frejacques, the director of DGRST, this task force will work in liaison with all the organizations which are already involved in biotechnology, such as the Pasteur Institute, the National Institute for Agronomical Research [INRA], and the National Institute of Health and Medical Research [INSERM], and of course the universities and industries.

More than Fr 25 million, out of the budget of Fr 45 million projected for 1981, will go to basic research, Douzou points out. This indicates DGRST's concern for doing everything possible to raise even further the already creditable levels of the public and private research laboratories in this field. Philippe Kourilsky, of the Genetic Engineering Service of the Pasteur Institute, and France Plassier-Normand will be responsible for this "basic biology" sector.

Within the framework of this research, the plans include a special effort in microbiology, as well as plans for establishing microorganism "strain banks" like those that exist already in foreign countries. Also planned is a "gene bank" at the Pasteur Institute, which will operate in cooperation with the Lyon and Strasbourg groups.

The other major effort will be made in the area of training a greater number of engineers specialized in the techniques of biotechnology--and with higher levels of training. Discussions are in progress with the Ministry of Universities and Ministry of Education to find solutions to this problem, which can be solved only in the intermediate term. Meanwhile, scholarships will be granted to researchers who wish to prepare themselves to enter this sector, to help them change fields or obtain training in a particular technique.

Finally, an information and aid commission, directed toward industries, has been established. A bulletin will be published to say "who is doing what" in the various biotechnology laboratories. The steps will be simplified for industries that wish to launch into the development of biological applications. Support will be given to specialized centers, such as the Technology University of Compiegne, the Pasteur Institute, Toulouse and Strasbourg universities, and the new center planned in Grignon.

In this area of applications, DGRST will work in direct liaison with the Committee for Strategic Industries and Developmental Guidelines [CODIS] and the National Agency for Valorization of Research [ANVAR]. There are already plans for carefully focused efforts in the field of medications, where certain specific products, such as interferon, important in combating viruses, or the production of what are called monoclonal antibodies, which offer new possibilities in that they represent the means for massive production of substances perfectly identical to one another.

9828
CSO: 3102/246

ONLY MODEST INCREASE IN ENERGY RESEARCH FUNDS THROUGH 1984

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 16 Apr 81 p 1

[Text] Current medium-range plans of the Ministry of Research for energy research foresee only minor increases in expenditures for this area in the years until 1984. Internal Ministry of Research plans reveal the following expenditures:

Medium-Range Plans for Energy Research Expenditures in Millions of DM

Purpose/Year	Actual 1980	Authorized 1981	Authorized 1982	Authorized 1983	Authorized 1984
1. Non-nuclear energy research technology	415.1	581.2	635.0	677.0	715.0
2. Non-nuclear future investment	90.7	48.6	40.0	35.0	30.0
3. Nuclear energy research	707.1	817.6	904.1	950.4	1,019.4
4. Energy research at centers	876.7	883.9	925.1	962.3	1,011.0
Total	2,089.6	,331	2,504	2,625	2,775

The research ministry's energy research funds allocated for non-nuclear and nuclear energy research do not even ensure the current status of the state's research facilities. In addition, the funds allotted are insufficient to finance approved projects, as there is a shortage of more than DM 1.8 billion at this time in the area of reactor development. The financial difficulties of the Ministry of Research are one reason why the government's energy program, which expired in 1980, still has no successive program for 1981 to 1984. Uncertainty about the continuing form of state energy research characterizes not only reactor research but also measures for coal gasification and the restructuring of research centers.

In spite of DM 220 million, which the Ministry for Research has given out since 1973 for expert opinions, this ministry is unable to meet a deadline for presenting an energy research program for the years ahead. This is unique among comparable industrial nations in the Western World. As the figures in the table show, no expansion will take place in both nuclear and non-nuclear areas if the current financial plan of the Ministry for Research is retained. Non-nuclear energy research is set at 60 percent for funds for coal gasification. State funds allotted so far will at most be enough to finance one large-scale plant in the next 5 to 10 years.

In view of these extremely gloomy prospects for state research funds, there is talk within the coalition of using funds from the "penny coal tax," since increased to three times that amount, which are administered through the Federal Trade Office, for coal gasification and district heating. In 1981 funds for the coal tax will amount to about DM 2.3 billion.

Regulations state that legally only a portion of these funds can be diverted to subsidize the conversion of coal to electricity, since the heating price of coal is at present substantially lower than the heating price of oil.

In spite of other independent subsidies, for example, the investment subsidies for coal-fired generating stations, it must be expected that in 1981 expenditures from the treasury in Frankfurt will be lower than income for 1981. A further reduction in the tax rate, on the basis of the electricity legislation, from an average of 4.5 percent to a lower figure can hardly be expected in view of the state's financial woes in every area. So it can be anticipated that the billions in this enticing pot in Frankfurt will be tapped. In that event the financial worries of the Ministry for Research would be over for the next several years.

9581
CSO: 3102/262

TEN YEARS' PROGRESS IN GEOTHERMY REVIEWED

Paris SEMAINE DE L'ENERGIE in French 6 Apr 81 pp 4-5

[Article: "Ten Years of Progress in Geothermy"]

[Text] A field now experiencing a "brilliant soaring flight:" that is how M. Giraud, the minister of industry, characterized the geothermal sector in France during a press conference when he assessed developments in the sector over the last decade. The assessment appears decidedly positive and encouraging.

To be able to appreciate the progress made in geothermy during those ten years, it is appropriate to recall the fundamental distinction between high-grade and low-grade energy:

--High-grade energy is characterized by water temperatures ranging from 150 to 300°C, and the steam produced may be used in electric power stations.

--Low-grade energy is characterized by water temperatures below 150°C; the energy is suitable for drying various materials and especially for various types of heating (urban space heating, greenhouses). The great majority of the geothermal resources in France come under this second category.

Since 1970, the date of the first important application of geothermy in France (at Melun), numerous innovations have provided contributions in the area of drilling techniques and subsurface exploitation and in the area of surface installations.

--In the subsurface domain, the "doublet" technique introduced at Melun contributed in an important way to the development of exploitation of geothermal energy. The method involves a set of two wells, making possible simultaneous reinjection of cooled water to maintain field pressure with a constant flow rate. Another important item is the technique of deviated wells, which start from points very close together (10-20 meters apart) and are deflected during drilling at a divergent angle so that the bottoms of the production and reinjection wells can be 1000 meters apart. This system avoids the need to assemble the drilling rig twice for these two wells and the need to lay surface pipelines between them.

--At the surface, some improvements have helped to protect circulation systems against corrosion (the geothermal fluid is usually very briny).

The development of campaigns undertaken in the area of geothermy is illustrated by the rapid growth of budget credits allocated to it: Fr 7 million in 1975, Fr 41 million in 1980, more than Fr 160 million in 6 years. To support the efforts being undertaken, the geothermy committee has developed a three-point system of financial aid:

--The committee provides a 50 percent subsidy for establishment of geothermal inventories and feasibility studies (26 studies in 1980 before entering upon work planned for 19-1/82).

--An investment subsidy covers 30 percent of the cost of the first well and an additional guarantee against 50 percent of the estimated cost of the well if the well is a failure.

--A mutual guarantee fund, whose constitution has just been decided, to underwrite the long-term mining risks, provided with initial government aid and subscriptions from the prime contractors involved.

The operations established thus far serve a total pool of 15,000 housing equivalents, 80 percent of which have been brought on line between 1976 and 1980. The principal service areas are those of Melun, Creil, and Mont de Marsan.

Implementation of a great many other operations is presently in progress, for a total of 33,000 housing equivalents, and the program to be launched by 1981 includes 36,000 housing equivalents. With a future pace of 40,000-60,000 housing equivalents per year, the goal of one million by 1990 is not unattainable. The most important sites include Strasbourg (5,000 units), Valence (4,000), Lamazere (4,600), Clermont-Ferrand (3,800), and Meaux (3,000).

As for high-grade energy, the limited resources in the mother country have led to a search for sites in the Antilles where EDF [French Electric Power Company] is planning the construction of a 4.5-megawatt power plant near Bouillant on the island of Guadaloupe.

Ten teams of researchers from CNRS [National Center for Scientific Research] have been doing university-level studies bearing on thermal energy transfer and geothermy of dry rock.

The efforts achieved by the geothermy committee also rely on the geothermal resource inventory projects carried out by BRGM [Bureau of Geological and Mining Exploration], first for the Paris Basin, then for the Aquitaine Basin, which are the two regions richest in geothermal sites.

In terms of diversification of energy sources with the purpose of reducing the energy dependence of France, the contribution of geothermal energy, though limited, is not negligible. After an experimentation phase, geothermy is now reaching the stage of industrialization, for which the experiments carried out thus far are providing valuable lessons. As New Energies delegate J. C. Colli remarks, "Practical experience in proper utilization of geothermy, including both rationalization and optimization of energy utilization, is a national priority."

9828
CSO: 3102/244

TERRESTRIAL APPLICATIONS DEVELOP FOR SPACE TECHNOLOGIES

Paris L'AERONAUTIQUE ET L'ASTRONAUTIQUE in French 1981-1 pp 37-51

[Article by Didier G. Compard: "ATHENA: A Policy for Developing Terrestrial Applications of Space Technologies"]

[Excerpts] The terrestrial outgrowths of space technology may be divided into two categories, direct and indirect. The direct outgrowths are the more numerous. They include all of the new nonspace markets that open and develop once a new applications satellite system becomes operational, for example, markets for earth telecommunications stations, computer terminals, home television sets, etc. Indirect outgrowths are not as easily definable and their benefits are more difficult to determine. Their impact is on nonspace commercial and industrial sectors utilizing techniques inherited from space activities.

Aerospatiale recognizes the special and general benefits to be obtained from exploitation of the indirect outgrowths of space science, in other words, the capabilities derivable from the techniques, technologies, and products the company has developed to produce its aerospace systems. As a result, for the past few years, Aerospatiale has been implementing a policy symbolized by the acronym ATHENA which means Applications of Outer Space Technologies to New Purchasers.

The following are the most interesting sectors listed in ascending order of their economic prospects:

a. Energy: storage of energy, civil use of nuclear energy, solar energy, and offshore oil.

b. Special applications of new materials: structural components of air and land vehicles.

c. Special-purpose equipment: medical data processing and analysis by computer, as with SYSCOMORAM [Modular Control Systems for Medical Research and Care]; the ATAL [expansion unknown] observation system.

d. Special research and know-how and specific technological facilities: plasma jet, pyrotechnics, safety systems, etc.

The rest of this article discusses a few of these outgrowths of space technology--the most significant or even most economically promising ones--in greater detail and examines the financial aspect of their exploitation.

Applications of Space Technologies

Inertial Energy Storage

The terrestrial application on which Aerospatiale is currently doing the most work is the storage of energy by inertial wheels.

Because of their dual property of producing angular momentum and storing a large amount of energy, flywheels were used on satellites initially to solve stabilization problems: high-speed inertial wheels creating gyroscopic rigidity or reaction wheels permitting precise attitude control about the satellite's axes. Subsequently they were employed to solve energy problems: mounted in pairs of contrarotating wheels, they replaced heavy unreliable batteries having an uncertain level of charge.

Initially mounted on ball bearings, these wheels are now proposed in servocontrolled magnetic suspension which eliminates all friction, reduces the wheel's own consumption of energy, and lengthens its service life.

The technologies used by Aerospatiale to produce these wheel systems are:

a. Magnetic suspension with passive radial centering (permanent magnets) and servocontrol solely for axial centering, the so-called single-axis bearing.

b. Direct current motor-generators without iron in the armature and with electronic commutation.

c. Wound rotors made of composite materials, and capable of operating at very high speeds and under extreme radial stress.

Developed for systems operating in the vacuum of space which is their natural working environment, these three technologies are adaptable to terrestrial applications provided the wheel is placed in a vacuum chamber. That is how:

a. Magnetic suspension of heavy rotors is possible with larger magnetic suspension rings and with power amplification on the axial servocontrol system.

b. Motors can be given the capability of generating a few kilowatts of power, as has been demonstrated experimentally.

c. Rotors with a storage capacity of 1 kilowatt-hour of usable energy will be in either a steel version (already produced) or a glass-resin composites version (defined, designed, and in production).

d. Rotors storing from one to a few dozen kilowatt-hours are currently being defined.

e. Preliminary studies have been made on terrestrial projects in the kilowatt-hour to megawatt-hour range.

The principal types of terrestrial applications are:

a. Emergency power supply in the kilowatt-hour range.

b. Storage in the 10 kilowatt-hour range for transient energies, but also as an emergency power supply.

c. Kinetic energy storage for vehicles with hybrid propulsion systems. For example, the energy lost when braking is recovered and regenerated when starting and going uphill, thereby enhancing the thermal engine's efficiency.

d. Providing emergency power or smoothing out land variations over electric power transmission and distribution systems.

Aerospatiale is currently developing a demonstration prototype of an inertial energy storage system (ACE) for the General Telecommunications Directorate. This system was defined by the National Center for Telecommunications Studies. This ACE is a real innovation and an excellent example of the outgrowths of space science. It will store 1 kilowatt-hour of energy and restitute it, when needed, within 20 minutes to steady-state power of 3 kilowatts.

It will be used as a source of emergency power for telephone exchanges. Connected in series to the EDF [French Electric Power Company] power grid, it will serve to eliminate all very small power failures and avoid interruption of service during outages, in the EDF power network, because as soon as such an outage occurs and within 20 minutes, a power generator unit is turned on to handle outages lasting more than 20 minutes.

The experimental model is now undergoing qualification tests. It is planned to mass produce the ACE because of the advantages it will offer over chemical batteries, for example:

a. Immediate response time with great reliability;

b. No programmed maintenance: satellites are required to have a maintenance-free service life of 7 to 10 years and more;

c. Small dimensions;

d. Financially competitive.

On the basis of a very thorough industrialization study, it can already be said that the cost of 80 percent of ACE parts does not exceed the standard manufacturing cost per kilogram in large-scale industries. Some 10-kilowatt-hour models are also under development with the backing of the Ministry of Industry. Wheel systems with electric input-output in the 1 to 50 kilowat -hour range are under study for possible use on terrestrial vehicles.

These developments may well be extended to high-capacity energy storage stations installed along high-voltage lines and close to urban centers. These stations could consist of a set of several shafts equipped with large inertial flywheels that are electrically interconnected and automatically supplied with power by these

high-voltage lines during off-peak hours. During peak load periods, the power network would, therefore, be freed of its usual load fluctuations and the flywheels would furnish the desired necessary complement.

Photovoltaic Conversion of Solar Energy

Present-day automatic satellites have an operational lifetime of more than 7 years. The electricity required to operate the spacecraft and power its payloads--communications, television, data collection, observation, etc.--is supplied by solar cells. On the first-generation satellites, these cells were affixed onto the outer surface of the satellite and supplied approximately 300 watts of power. Today the cells are in the form of solar panels that can be deployed when the space craft is in orbit. These three-axes stabilized panels are connected to the main frame of the satellite and are capable of generating several kilowatts of power. The panels are covered with a multitude of small electrically interconnected solar cells generally made of silicon. Irradiated by the sun, these cells are the heart of the photoelectric processes that generate currents.

The cost per kilowatt of electricity supplied by these electricity generating subsystems is high because the "spatialization" of their components requires them to be of minimal weight, necessitates the use of costly technologies, and demands a long maintenance-free service life. In addition, the unit cost of such sensitive elements as the solar cells is itself very high and the efficiency of these cells is low.

Less sophisticated characteristics are conceivable for terrestrial applications, but the economic aspects of these systems have to be comparable to those of conventional systems utilizing oil, gas, coal, water power, etc.

In the development of these terrestrial applications, Aerospatiale is a partner in the French Sophocle program for the design and construction of a pilot 5-kilowatt central power station capable of supplying the power needed by a remote community of 500 to 1,000 residents. Operational 20-kilowatt units can be readily derived from this pilot power station.

The main component of this station is a photovoltaic array ("heliostat") consisting of several collector modules mounted on a rigid steerable frame. Each module has six concentrator photovoltaic cells on its bottom surface. These 150-millimeter square lenses focus concentrated solar energy onto 20-millimeter square lenses, thereby giving a concentration ratio of 50. The supporting frame steers and positions the array perpendicular to the incident insolation. In addition to this photovoltaic array, the central power station includes an inverter for developing a.c. power, and an energy storage system.

The first phase of this COMES [Solar Energy Commission] program is being conducted by the National Center for Scientific Research's LAAS [Automation and Systems Analysis Laboratory]. This phase involves operation of a 12-square meter prototype photovoltaic array consisting of 60 modules developing 27 volts d.c. for maximum power of 1 kilowatt. Qualification tests have confirmed this capacity and the program's pilot 5-kilowatt central power station with a 50-square meter array composed of 240 basic modules is now under development. Industrialization and

marketing of this system are being defined and negotiated. The cost effectiveness of producing a Sophocle system--several megawatts per year--is now under study.

Figure 17 [at the end of this article] contains a photograph of the Sophocle photovoltaic array and also of a new reflecting solar concentration system--concentration ratio of 100--the ES. THER. EL [(?) Solar Energy. Thermoelectricity] designed by Aerospatiale and capable of producing 1 kilowatt of electricity and 5 kilowatts of hot water. This new system is in the prequalification stage.

Applications of Composite Materials Technology

Composite materials are one of the most significant examples of aerospace materials being used for other applications. Special materials were developed for ballistic missile reentry vehicles and rocket nozzles, materials capable of withstanding the powerful thermomechanical stresses encountered during the extremely high heat of atmospheric reentry or of propulsion. These materials called carbon-carbon composites consist of a carbon sheathing produced by different methods--weaving or others--and a carbon matrix obtained by complex physicochemical processes requiring a lengthy industrial development effort.

While they can be used for structures of reentry vehicles and nozzles, these materials, such as the Aerolor composites, are also finding, because of their very special properties, applications in highly different fields ranging from heavy-duty brakes to structural components of high-temperature central power plants. Consideration is even being given to their use in prostheses.

Because this type of terrestrial application of space technology is commercializable and is, in fact, already commercialized, these various composite materials have been trade-named. Designed and developed jointly by Aerospatiale and Carbone-Lorraine, they have the registered trade name of Aerolor.

These materials are currently in the predevelopment stage, but from the very first study of their applications, the prototype materials offered on the market were designed for optimum cost-effectiveness by using automated or automatable production methods. It should be possible, therefore, to introduce advanced technology materials offering indisputable economic advantages under acceptable economic terms and conditions. For example, the replacement of steel brake disks by carbon-carbon disks is acceptable only if the extra cost is offset by the savings derived from the material's advantages: weight savings on a vehicle thereby increasing its load capacity, energy savings, etc., reduced wear resulting in less maintenance and replacement of parts, etc. There will be a market for material derived from space technology (brakes for commercial vehicles) only if this economic condition is met.

Economic Considerations

Figure 21 [at end of article] depicts the performance and prospects of activities related to all outgrowths of space technology researched, developed, or commercialized by Aerospatiale in the various sectors discussed earlier in this article. Figure 21 highlights the following main points:

1. A policy, even a limited one, for exploitation of the technological outgrowths of space science can produce an increase in the sector's activity. In fact, this activity can rise to about 10 percent of total activity in 5 years time, regardless of what assumption--best-case, or more realistically, the so-called average-case--is made about market prospects for terrestrial applications of space technology.

2. Aerospatiale's initial share of the financing is substantial, but its relative value does steadily decline. It is noted, however, that accelerations--increases in the absolute value of the financing furnished by the firm itself--are necessary if a firm wants to penetrate profitable markets. In that case, the injection of funds by the manufacturer and by agencies that finance new developments is absolutely necessary to achieve sure profitability in addition to increased activity. This profitability will generally differ from forecasts which are usually based on economic conditions that are difficult to foresee and nearly always optimistic.

As an example, Figure 22 [at end of article] shows the relative distribution of the financing for research and development activities connected with the previously mentioned inertial wheels. This graph clearly shows that:

a. The manufacturer's own financial effort--70 percent--was considerable;

b. National or international space agencies did help, but their contribution--5 percent--was incommensurable with the manufacturer's;

c. At the end of the period, the customers' share, which corresponds to concrete applications programs, had reached 25 percent.

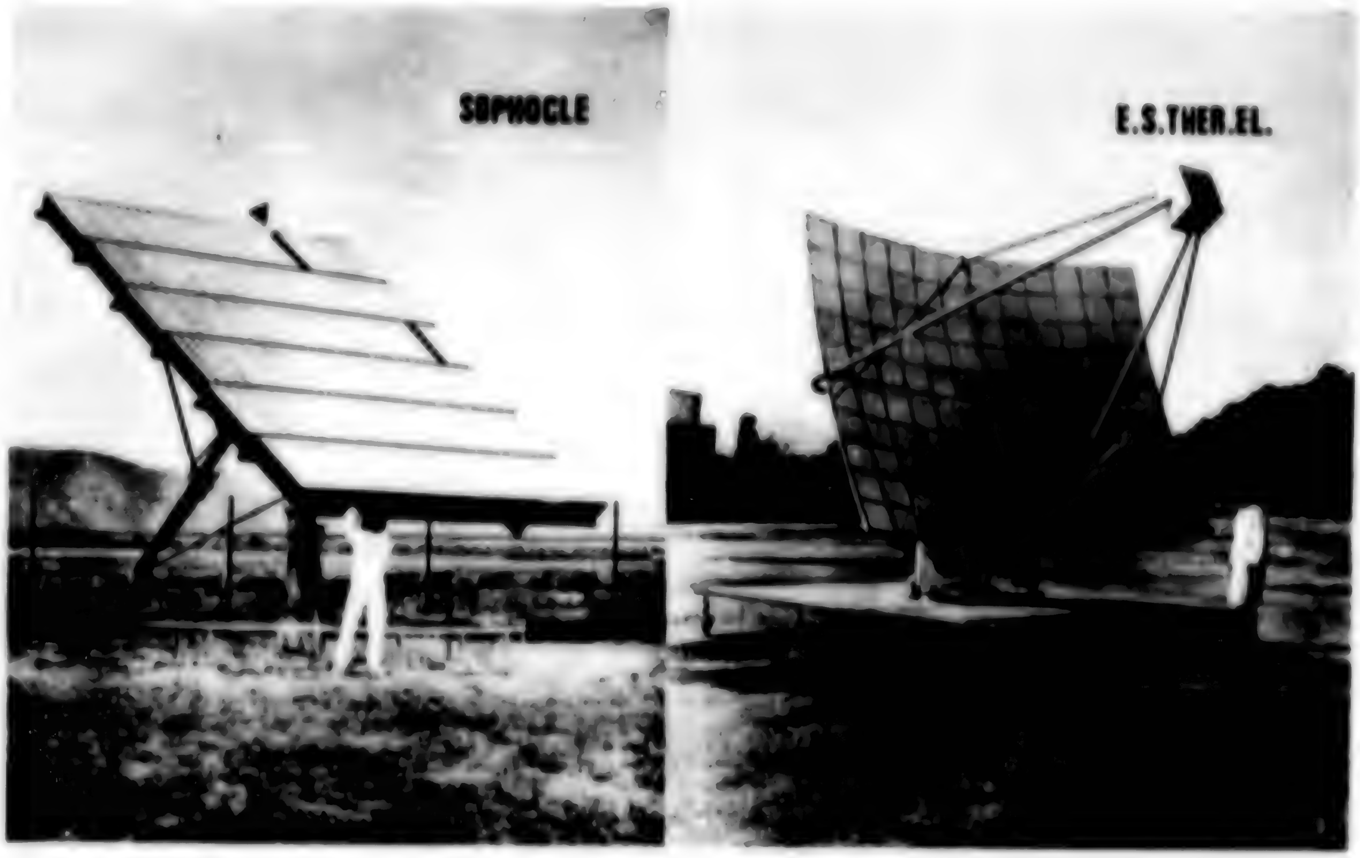
Conclusion

There is practically no longer any doubt that the direct terrestrial outgrowths--telecommunications, remote sensing, television, etc.--are a confirmation of the fact that space yields direct benefits to man and that applications of these outgrowths are industrially and commercially profitable. The same is not true, however, of the indirect outgrowths which we have rapidly reviewed.

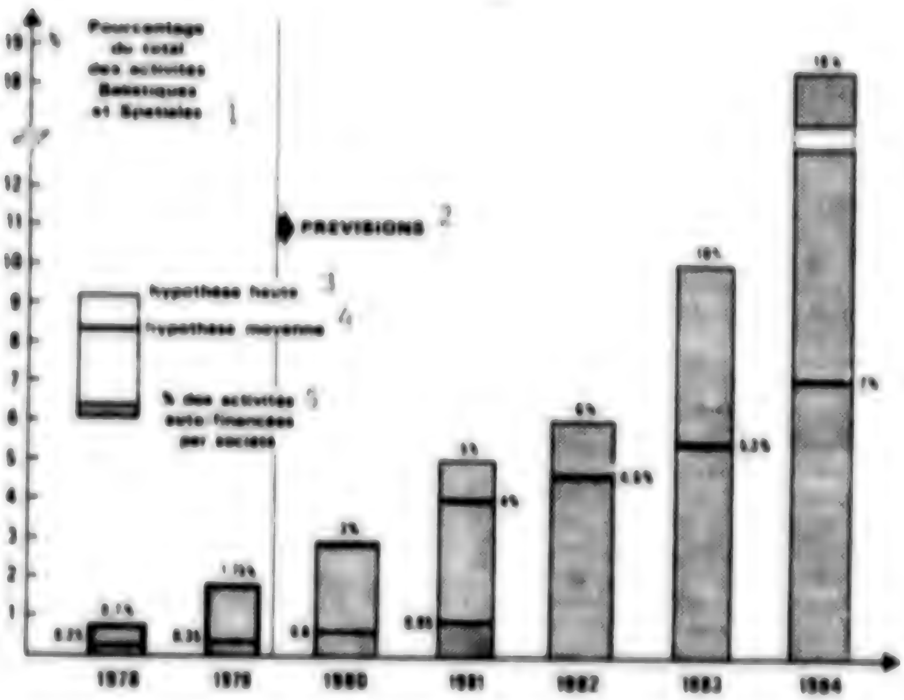
Nevertheless, with limited but precise profit goals, it is possible to find specific applications slots that are certainly of both general and industrial interest.

The economic and commercial outlook for industry is promising. There are large prospective markets, but these markets will no doubt materialize less rapidly than marketing research conclusions would have us assume.

Lastly, this type of entrepreneurial activity demands patience and a financial outlay, mainly by the manufacturer, to convert space technology into programs with terrestrial application. To succeed, it must also overcome a certain internal inertia and some occasional external skepticism.

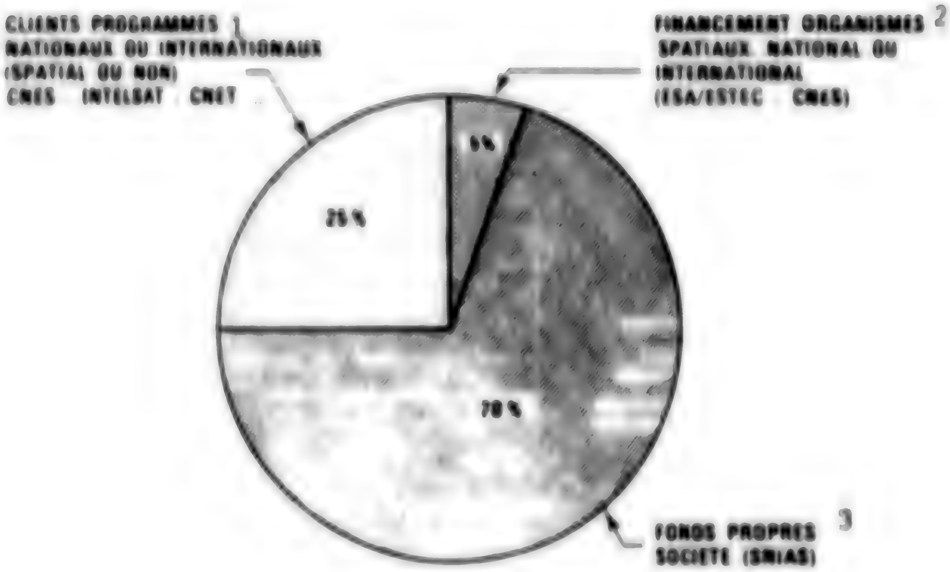


Sophocle and ES.THER.EL Prototype
Photovoltaic Concentrator Arrays



Performance and Prospects of Activities
Related to Outgrowths of Space Technology

1. Percentage of total activities of Ballistic and Space Systems Division
2. Forecasts
3. Best-case
4. Average-case
5. Percent of activities financed by Aerospatiale itself



Financing of inertial wheel activities
and applications from 1973 to 1979

1. Customers in national or international space or nonspace programs: CNES [National Center for Space Studies], CNET [National Center for Telecommunications Studies], and Intelsat [International Telecommunications Satellite Organization]
2. Financing by national or international space agencies: CNES and ESA-ESTEC [European Space Agency-Space Technology Center]
3. Company's (Aerospatiale) own funds

8041
CSO: 3102/254

BRIEFS

RESTRUCTURING OF COMES--The Solar Energy Commission [COMES], which just celebrated its third anniversary, has announced the establishment of its new organizational structure. Two technical departments have been created: the Department of Solar Technology, which is concerned with: low-temeprature heat, solar architecture, photovoltaic conversion, solar thermodynamics, and wind energy, and the Department of Biomass Technology, which is involved with all of the approaches for biomass utilization as well as transformation technologies. On the other hand, the Directorate of Plans and Forecasting will take responsibility for promoting products that reach a sufficient level of technical maturity and economic productivity. This restructuring is intended to enable COMES to better handle its role of stimulation and promotion. [Text] [Paris SEMAINE DE L'ENERGIE in French 6 Apr 81 pp 12-13] 9828

SOLAR COLLECTOR 20 PERCENT BETTER--At the ish '81 exhibition in Frankfurt Krupp exhibited a flat collector which has a 20-percent better performance compared with the previous model. The new Arbonia solar collector utilizes more solar energy not only under clear skies but also under cloudy or even cloud covered skies. An annual heat yield of more than 600 kWh/m^2 is achieved. That means more warm water in the shortest time. The components of the collector are the frame with its cover and the absorber plate which is elastically suspended in the frame. The collector, with its rigid frame of anodized aluminum, is corrosion-free and resistant to damp, extreme cold and static temperatures of more than 200°C. The hardened safety glass cover is thin-walled and remains highly transparent in all weathers, allowing unobstructed solar radiation to the nickel-oxide layer on the absorber plate. The highly selective layer absorbs 95 percent of the irradicated light and converts it to heat. The aluminum absorber plate is also corrosion resistant and has good thermal conductivity. The roll-bond technique used to manufacture the pipes gua ees complete watertightness. A non-hygroscopic, nonflammable and aging resistant insulating layer protects the plate against heat loss to the sides and rear. Many arrangements are possible for installing the flat collector: on sloping, flat or slanting roofs, on vertical or sloping facades, in the open air on slopes or hillsides--lying horizontally or standing vertically, standing on end or on its side. Several collectors can be linked together using concertina couplings of chrome-nickel steel and connected to the grid. Tried and tested accessories, such as complete control systems and solar storage units, supplement the collector. [Text] [Duesseldorf VDI-NACHRICHTEN in German 27 Mar 81 p 27] 9581

SUPER WINDMILL--Bonn--Construction will begin in May on a "super windmill," the "Growian" (Grosswindanlage [Strong Wind Unit]), which is intended to produce electricity and will be built in Kaiser-Wilhelm-Koog, in Schleswig-Holstein (northern FRG), according to a 12 March announcement by Erwin Stahl, parliamentary secretary of state for research. The MAN firm of Munich, entrusted with the construction of this installation, is presently studying the loading capacity of the blades of the rotor. These blades are 50 meters in length. The giant propeller installed atop a tower 100 meters high at the mouth of the Elbe ought to give the Growian a production capacity of 1 to 3 megawatts and permit annual savings of up to 4 million cubic meters of natural gas or a million liters of oil. [Text] [Paris AFP SCIENCES in French 19 Mar 81 p 30] 9828

CSO: 3102/246

FRENCH COMPANIES COMPETE IN INDUSTRIAL ROBOT MARKET

Sormel's Unique Handlers

Paris ELECTRONIQUE ACTUALITES in French 1 May 81 pp 1, 3

[Article by G. Bidal]

[Text] With more than 1,500 robot handlers sold since its establishment, almost half of which were exported, the small Sormel Company, with a clock- and watch-making background, climbed to first place among French companies in the field of light assembly robotics undergoing full development. It has just presented two models of unique handlers, the Sorbomat, a real modular component kit, and the Cadratic, a simple robot constructed on the model of an XY table, without any equivalent on the market, it seems.

Automatic assembly calls for very specific products developed most frequently for single applications and Petiteau, PDG [President-General Manager] of Sormel, describes the company as "a huge research department." The Besancon Company has, nevertheless, developed a large catalogue of standard and modular products that figure, on the average, for over 30 percent in the cost of its final products. Along the same line of thinking, it has just added to its catalogue a handler sold in the form of a kit, the Sorbomat, capable of gripping, of making linear or rotary transfers with parts ranging up to 35 kilograms. The various components--180° turntable, linear modules with various travels (up to 1 meter), rotary heads and arms, gripping pincers--are assembled like a Meccano set.

Simplicity

Sormel is also introducing a very unique robot handler, the Cadratic, which is presented in the form of a hollow frame in which it moves, according to the principle of an XY table, supporting eight tools moving individually on the Z axis. These tools can support soldering heads, screwing, insertion, gripping or cutting mechanisms. Driven by fixed electric motors (step-by-step motors, 400 steps per turn), it is controlled by a simple programable robot and can perform 1,800 different operations an hour. Step resolution is 0.123 millimeters for a repeatability (capability of finding a given point) of ±0.025 millimeters. Because it is very universal in structure, it is intended for a number of applications, only part of which have undoubtedly been explored, starting with electronics in which, although it does not have the speed of automatic insertion machines, it can be used for small-scale production lines. The Cadratic will be used, moreover, by Jaeger for automated

assembly of automobile dashboards. MATRA might also incorporate it in the assembly lines for the electronic directory terminal or the wide distribution facsimile system.

Sormel, a 59-percent subsidiary of the YEMA Masters Company and, therefore, indirectly of MATRA, employs 150 persons at present. In 1980, it achieved a turnover of 25 million francs and should undergo a growth of at least 25 percent this year.

Economic Interest Group

Paris ELECTRONIQUE ACTUALITES in French 1 May 81 p 3

[Text] Five French companies have decided to combine their efforts, for the purpose of setting up a sales and promotion strength unique in the field of assembly, in the form of a GIE [Economic Interest Group]: UNIMATIC.

It consists of the following companies: Sormel (turnover of 25 million francs in robot handlers), SEIV-Automation (subsidiary of Renault-Machine-tools, turnover of 110 million francs, including 35 million francs for three-dimensional measuring machines, in addition to assembly and flexible transfer lines, a new activity in self-propelled carriers), Guillemin (riveting presses, twisting machines, turnover 7 million francs), LBM Presses (hydraulic assembly presses, turnover 30 million francs), and LBJ Presses (pneumatic presses, turnover of 5 million francs).

UNIMATIC represents a 12-person sales force and the activity carried out within the framework of the GIE produced a turnover of 85 million francs in 1980, 85 percent of which was exported.

Depending on the nature of the projects, prime contracting is assigned to one of the members. Aside from grouping the sales force, the advantage of the GIE lies in the possibility of increasing the share of standard materials in the production of special machines, which should amount, on the average, to 35 to 40 percent of the final cost prices--exceptional rates in the field of assembly.

Finally, as its head, Roche, points out, "UNIMATIC is also a reflection and coordination structure, with the ambition of guiding research and development activities toward the products and assembly techniques of the future."

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CURRENT WEST EUROPEAN CIVIL AIRCRAFT PROJECTS REVIEWED

Paris L'AERONAUTIQUE ET L'ASTRONAUTIQUE in French 1981-1 pp 3-36

[Article: "Commercial Aircraft"]

[Excerpts] The BAe 146 four-engined jet transport is expected to make its first flight in May 1981. The center fuselage is being built at British Aerospace's Bristol plant, the rear fuselage at its Chadderton plant. Short Brothers Ltd. is manufacturing the engine nacelles, Avco Aerostructures of Nashville, Tennessee, the wing boxes, and Saab-Scania all movable control surfaces. The first fuselage is currently being assembled in British Aerospace's Hatfield plant. An initial production run of 25 aircraft is now underway.

The fuselage has a diameter of 3.38 meters. The BAe 146 is available in two versions:

a. Series 100 with a main cabin 15.42 meters in length, a seating capacity of 70-90 passengers, and a baggage hold of 14.16 cubic meters.

b. Series 200 with a main cabin 17.63 meters in length, a passenger capacity of 146-200, and a baggage hold of 19.09 cubic meters.

The BAe 146 is powered by Avco Lycoming 502R-3 engines that are slightly more powerful (3,040 daN) than the initially planned 502-H engines (2,950 daN). These jet engines installed in their pods have undergone icing tests which included spraying them with cold water.

The servotab-equipped elevators and ailerons are cable-actuated. The rudder is the only control surface equipped with a dual hydraulically operated servocontrol unit. The wing flaps are actuated by an electro-hydraulic motor driving torque tubes and screw jacks.

The cabin air conditioning system regulates temperature by means of three heat exchangers and its hot air is bled from the engines. The cabin pressurization system has a compressor maintaining a differential of 0.45 bars.

It should also be noted that the wing skin panels are bonded to the spars in an autoclave and that the floor of the baggage hold is 1 meter above ground level, thereby making loading operations easier. Futhermore, fatigue tests designed to simulate 25 years of use are currently being conducted on the nose and the forward

part of the fuselage in a water tank at Hatfield.

An initial order was recently received from the Argentine airline Lineas Aereas. It covers three aircraft--two series 100 for delivery in March 1983 and one series 200 for delivery in October 1982--with an option on three additional aircraft. An American order is also expected shortly.

Short Brothers

The SD-330 is a 30-passenger transport aircraft designed for commuter and regional service. Sales have reached a total of 70. This aircraft was exhibited in static displays and flight demonstrations.

A 36-passenger version of this transport, the SD-360, is now in production. A mockup of this new model was displayed at the company's stand. The SD-360 has the same wing as the SD-330, with a span of 22.75 meters, a gross area of 42.08 square meters, and an aspect ratio of 12.3. It is straight, slightly dihedral, and strut-braced on each side. The fuselage has been lengthened to 21.49 meters, and the cabin from 9.47 meters to 11.02 meters (passenger compartment volume: 41.06 cubic meters). The aircraft has but a single fin and rudder unit and is powered by two United Aircraft of Canada 1,300-horsepower PT6A-65A turboprop engines suspended forward of the leading edge of the wing and replacing the SD-330's 1,180-horsepower PT6A-48A engines.

The SD-360 will have an operating empty weight of 7,480 kilograms, a payload of 3,184 kilograms (36 passengers and their baggage), a fuel load of 993 kilograms, thus giving the aircraft a total weight of 11,657 kilograms, a wing loading of 278 kilograms per square meter, and a power loading of 4.5 kilograms. Under these conditions, with a takeoff run of 1,300 meters and cruising at 390 kilometers per hour with its normal fuel reserves, the aircraft will have a range of 426 kilometers. With a reduced payload and 4,500-liter (3,184-kilogram) fuel tanks, it will have a range of 1,050 kilometers.

The SD-360's sales price is 13 million francs. Its first customer, Suburban Airlines of Reading [Pennsylvania], has ordered four.

Short Brothers believes there is a potential combined market for some 300 SD-330 and SD-360 aircraft. The production rate will be four per month with deliveries beginning in 1982.

Dornier

The DO 128-6 is a new version of the DO 128-2 Skyservant twin-engine commercial light transport. It flew for the first time on 4 March 1980 at Oberspfaffenhofen and was demonstrated in flight at the Farnborough air show. It is powered by two United Aircraft of Canada PT6A-110 turboprop engines each derated to 400 horsepower and mounted, as on the basic DO 128-2, on stub-wings. Because of its excellent performance characteristics, the DO 128-6 has been put into mass production.

The aircraft has an overall length of 11.41 meters. It has a slightly elongated wing with a span of 15.85 meters, a gross area of 29 square meters, and an aspect ratio of 8.8. It has an empty weight of 2,540 kilograms and a takeoff weight of

4,300 kilograms--4,015 kilograms for the aircraft powered by reciprocating engines--thus enabling it to carry a payload of 1,273 kilograms and a fuel load of 487 kilograms. It has a takeoff-to-15 meters run of 544 meters, a rate of climb of 6.4 meters per second, a cruising speed of 339 kilometers per hour--273 for the basic DO 128-2--, a landing speed of 125 kilometers per hour, and a range of 1,460 kilometers.

The TNT [new technology wing] testbed aircraft (Figure 1 photo at end of article] is powered by two Garrett TPE-331-5 turboprop engines rated at 715 horsepower. The aircraft flew demonstration flights during the Farnborough air show. Results of the first 100 test flights are considered very good, in that the aircraft attained a maximum level speed of 337 kilometers per hour, a rate of climb of 13 meters per second, and a load factor of 3.3g. Several types of Hartzell and Dowty propellers have been tested, particularly those featuring supercritical-profile blades. The next tests will cover the high-lift system, the flaps and associated spoilers being extended throughout the entire wing span. Studies are continuing on the use of Kevlar in secondary parts of the airframe.

Because of the highly encouraging results obtained in test flights of the TNT testbed aircraft, Dornier is building an LTA (light transport aircraft) whose dimensions differ slightly from those announced at the 1979 Paris air show. It will have an overall length of 13.3 meters. Its wing will have a span of 16.97 meters, a gross area of 32 square meters, and an aspect ratio of 9. Fitted with electrically-operated Fowler type trailing-edge flaps, this wing, whose skin, spars, and ribs are integrally milled into a thick plate, has thicker transonic sections (profiles) and constitutes an integral fuel tank with a maximum capacity of 2,900 liters. The wing has been tested in the large S-1 wind tunnel at Modane [France]. The model thus tested consisted of half of a transonic wing with part of a fuselage section. The aircraft will have an empty weight of 3,000 kilograms and a takeoff weight of 4,500 kilograms with a maximum wing loading of 142 kilograms per square meter. Its two Garrett TPE 331-5-252D 715-horsepower--power loading: 3.1 kilograms--turboprop engines are mounted on the leading edge of the wing, thereby appreciably improving the aircraft's lift-drag ratio. The LTA will have a cruising speed of 340 kilometers per hour and a rate of climb of 15.7 meters per second.

Work done on the TNT testbed and the LTA led Dornier to initiate development of two new versions of a light transport (commuter) aircraft, the DO 228-100 (Figure 2 at the end of article) and DO 228-200, designed for 15 and 19 passengers respectively. Mockups of both aircraft were exhibited at the Hanover and Farnborough air shows. Both have the same wing (Figure 3 at end of article) as the LTA, in other words, a wing comprising a constant thickness-chord ratio rectangular center section supporting the engine mounts, and two tapered outer panels. These two aircraft differ only in the length of their respective fuselages. They will each have a takeoff weight of 5,700 kilograms--wing loading: 178 kilograms per square meter--a takeoff run of 526 meters, a rate of climb of 10.4 meters per second, and a cruising speed of 432 kilometers per hour. They will be powered by either two Garrett TPE 331-5 engines rated at 715 horsepower (power loading: 4 kilograms), each driving a slow-turning--1,600 rpm--propeller, or two United Aircraft of Canada PT6A-135 engines rated at 750 horsepower (power loading: 3.8 kilograms), or possibly two PT6A-41 engines rated at 850 horsepower (power loading: 3.4 kilograms).

Dornier has been awarded a contract to study and test an amphibious aircraft capable of landing on the high seas. A mockup of three-engine DO 24TT, a derivative of the

DO 24 flying boat, was displayed at Farnborough. This aircraft has a straight high-wing braced on each side by an oblique strut the lower end of which is attached to a small sponson which helps stabilize the craft on the water (a standard design feature of Dornier flying boats). The DO 24TT is powered by three turboprop engines mounted above and forward of the leading edge of the wing, and driving large four-bladed propellers.

Dornier Transport Aircraft Data

Model designation	Power plant	Power at cruising speed (hp)	Takeoff weight (kg)	No. of passengers
DO 128-2	Lycoming 540(re)	2 X 380	4,015	8
DO 128-6	UAC PT6A(tp)	2 X 400	4,300	9
DO 228-100	Garrett TPE 331-5(tp)	2 X 715	5,700	15
DO 228-200	Garrett TPE 331-5(tp)	2 X 715	5,700	19

Abbreviations: re: reciprocating engine, tp: turboprop engines; UAC: United Aircraft of Canada.

Fokker

A survey of 25 airlines convinced Fokker of the need to design and produce a larger-size aircraft than the F28-600, the latest version of its F 28. The F28-600, has a gross weight of 33 tons and is powered by two jet engines generating 4,740 daN of thrust and aft-mounted on the sides of the fuselage, as on the basic F 28. The 600 version is capable of accommodating 100 passengers six abreast with a 34-inch seat pitch, or up to 150 in an all-economy configuration. Fokker has now abandoned the F28-600 project in favor of the F 29 which is also a twin-jet aircraft but with its engines mounted forward of the leading edge of the wing.

The F 29 has an overall length of 38 meters and a takeoff weight of 52 tons. It has the same type of flight deck as the Boeing 757 and 767. The aircraft is designed to carry normally 132 passengers six abreast with a 34-inch seat pitch, and will be able to accomodate up to 150 with a 29-inch seat pitch in an all-economy configuration. Subsequent "stretching" of the fuselage could increase the F 29's capacity to 200 passengers. The cabin is 25 meters long, 3.56 meters wide, 2.2 meters high, and located above the cargo compartment, the lower part of the "double bubble" fuselage section designed to hold 11 LD-W 41 X 91 X 41-inch containers similar to those carried in the DC-8 and the Boeing 727 and 707. The aircraft has 38 oval windows on each side of the cabin. There are two passenger doors on the sides of the fuselage, and two emergency exits in the part of the cabin over the wing.

The F 29 will have a thick supercritical semi-low-wing with a slotted leading edge. This wing has a 21-degree sweep, a 6-degree dihedral, a 34-meter span, a gross area of 115 square meters (wing loading: 500 kilograms per square meter), and an aspect ratio of 10.3. It is equipped with a high-lift system consisting of full-span leading-edge slats (a on Figure 26) and trailing-edge flaps (b and c, Figure 26).

Three spoiler ailerons (d, d_2, and d_3, Figure 26) help the standard ailerons (e, Figure 26) control the aircraft's movement in roll and can serve as air brakes in coordination with the petal-type air brakes on the fuselage tailcone (f, Figure 26). Development of this wing required 5,200 hours of wind-tunnel tests.

The F 29 has a cantilever T-tail assembly, but this design solution is reportedly not definite.

Composite materials--laminated glass and carbon fibers--will be used on certain structures, notably the lower part of the engine nacelles, the entire part of the wing behind the stressed box structure, the rudder, the wing to body fairing, and the rear air brakes. The use of composites will save about 500 kilograms in aircraft weight.

Various engines are being considered for the F 29: the 8,165 daN-thrust Rolls-Royce RB 432-05 engine (bypass ratio of 4.8 and pressure ratio of 18.7) and the CFM56-3 engine derated to approximately 8,000 daN which corresponds to a thrust weight ratio of 0.285.

Design performance of the F 29 includes the following: takeoff distance of 1,370 meters, maximum speed of Mach 0.75 at 10,500 meters altitude, approach speed of 213 kilometers per hour, and a range of 2,800 kilometers.

Fokker is trying to conclude an agreement with France for joint production of this aircraft whose size would place it in direct competition with Airbus Industrie's SA-1 project.

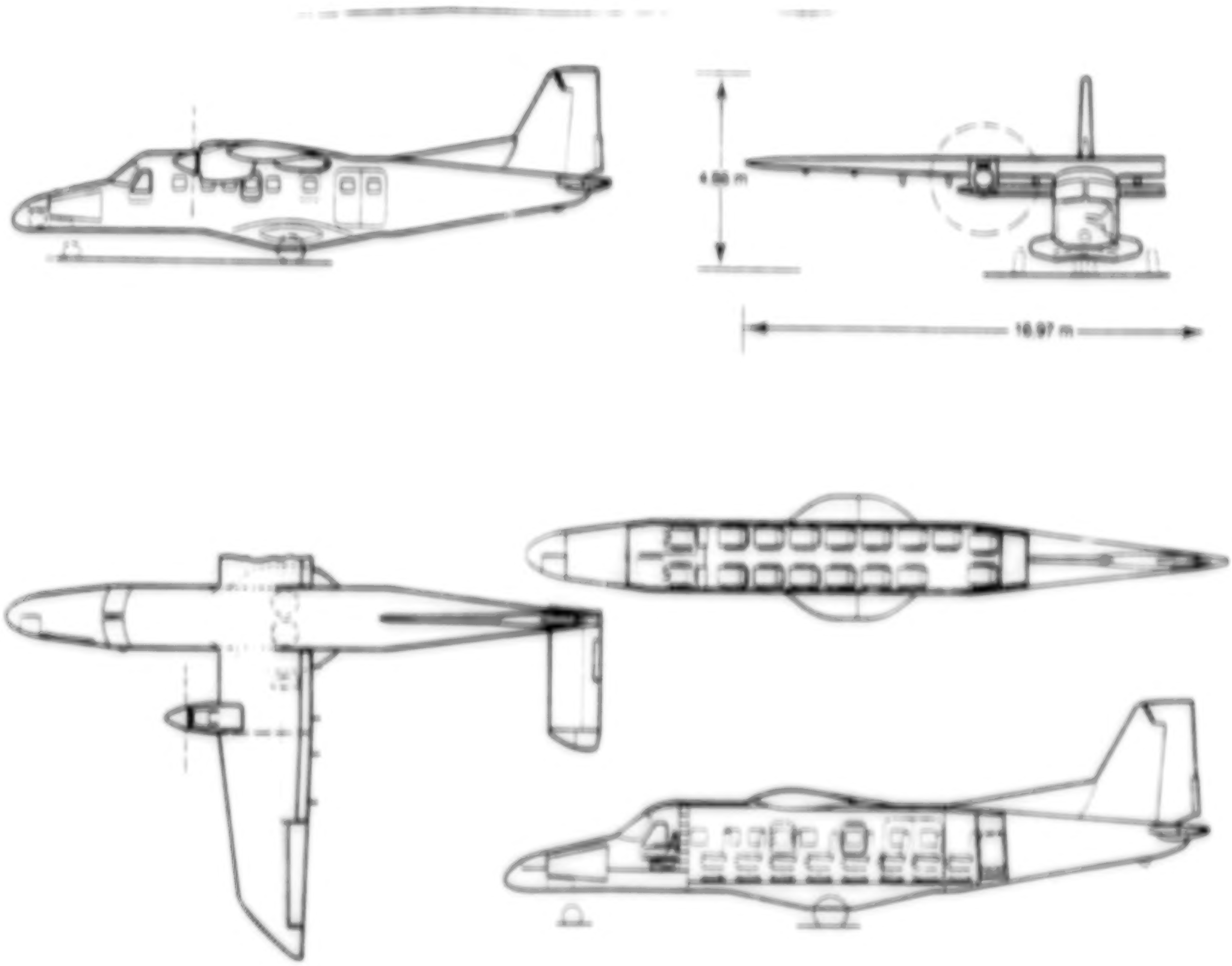
Experimental TNT (Dornier)

		Do 228-100	Do 228-200	EMB-120	L-600 série	Dash-8	C 212-200	AIT 230
1	Nombre de passagers	15	19	30	30	32	19	30
2	Longueur, m	15,03	16,55	19,64	20,85	21,61	15,2	
3	Envergure, m	16,97	16,97	19,77	18,85	25,00	19,0	21,26
4	Surface, m²	32	32	38,10	41,81		40,0	45,0
5	Masse à vide opérationnelle, kg			4 950	10 285		4 000	
6	Charge payante, kg	2 100	1 960	3 130	3 000		2 000	
7	Masse de carburant, kg			992	4 715		1 300	
8	Masse au décollage, kg	5 700	5 700	9 072	18 000	13 000	7 300	9 370
9	Nombre de moteurs	2	2	2	2	2	2	2
10	Type	TPE-331-5	TPE-331-5	PT7A	ALF 502 L	PT6A-2R	TPE-331-10	PT6A-65
11	Puissance, ch	715	715	1 500		1 700	900	1 173
12	Poussée, daN				3 400			
13	Charge alaire, kg/m²	178	178	240	430		182	207
14	Charge au ch, kg	4,0	4,0	3,0		3,8	4,1	4,0
15	Poussée/poids				0,38			
16	Longueur de piste, m	526	526	1 300	1 370	900	500	800
17	Vitesse de croisière, km/h	432	432	520	890		350	386
18	Vitesse ascensionnelle, m/s	10,4	10,4	13,5			8,6	7,26
19	Autonomie, km	1 970	1 150	650/2 600	6 300	2 200		

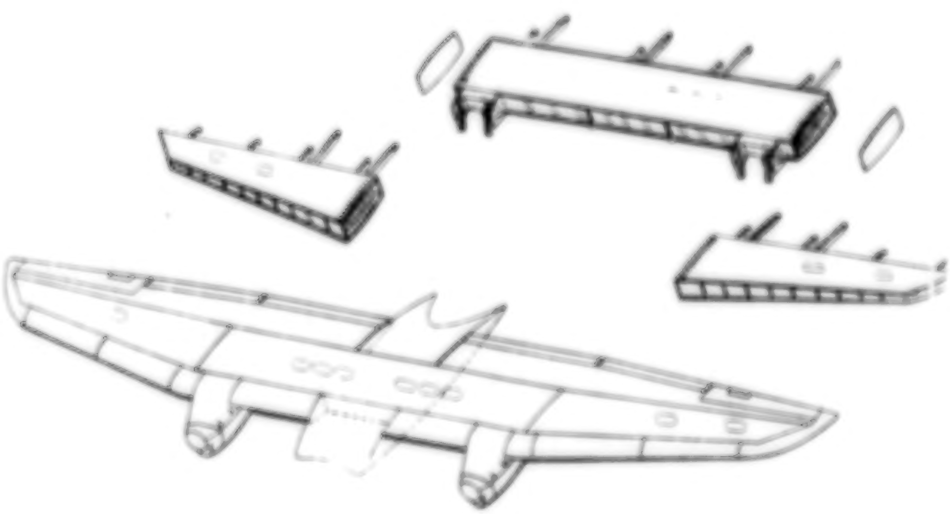
Characteristics and Performance
of Various Utility-Commuter Transports

1. Passengers
2. Length (m)
3. Wingspan (m)
4. Wing area (m^2)
5. Operating weight, empty (kg)
6. Payload (kg)
7. Fuel load (kg)
8. Takeoff weight (kg)
9. No. of engines
10. Type of engines
11. Horsepower
12. Thrust (daN)
13. Wing load (kg/m^2)
14. Power load (kg)
15. Thrust weight ratio
16. Takeoff field length (m)
17. Cruising Speed (km/h)
18 Rate of climb (m/sec)
19. Range (km)

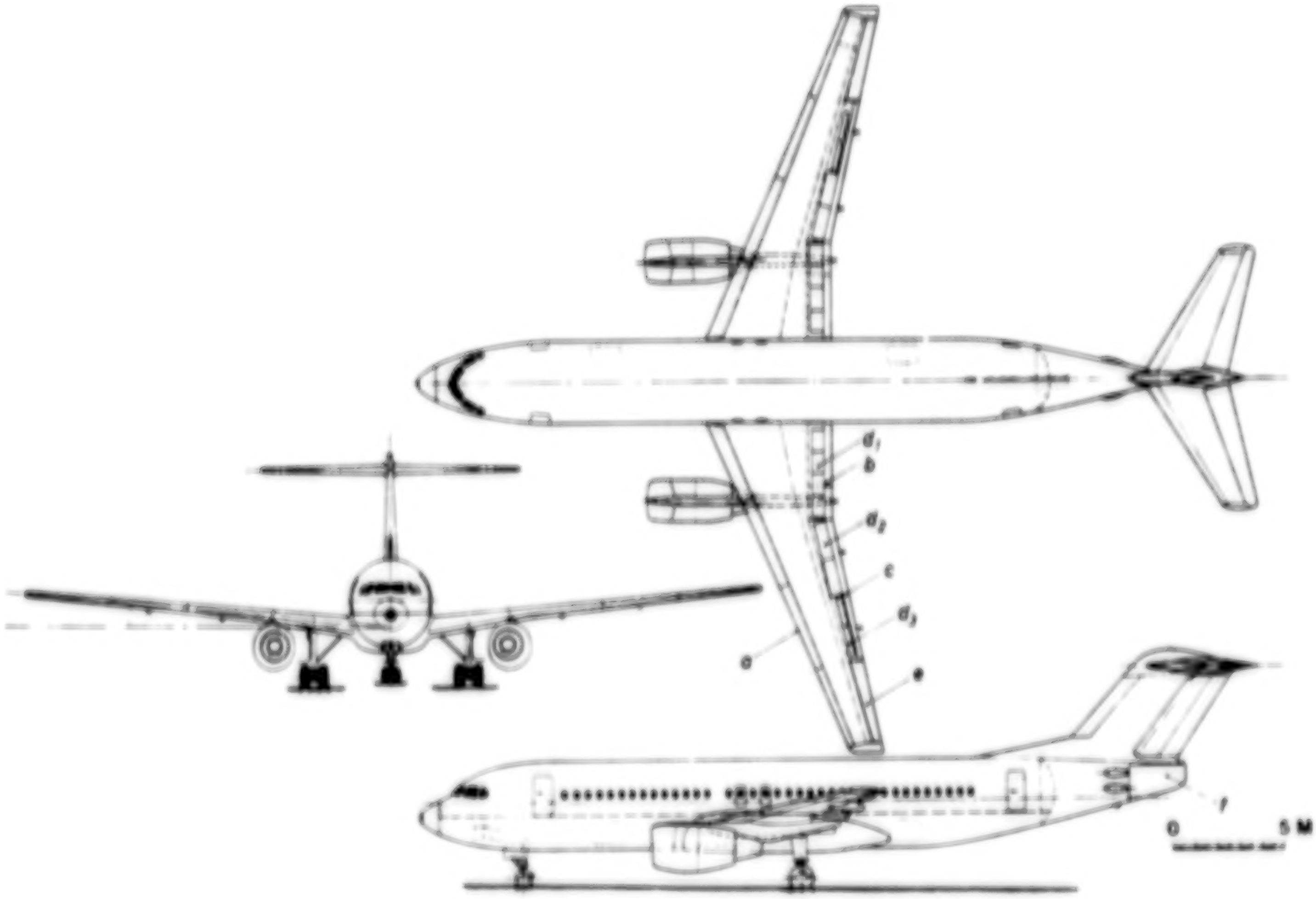
[Manufacturers: DO 228-100 and DO 228-200: Dornier, Germand; EMB-120: Embraer, Brazil; L-600 series: Canadair; Dash 8: De Havilland of Canada; C 212-200: CASA, Spain; and AIT 230: Aeritalia.]



Do 228-100 (Dornier)



Wing of the Do 228



Three Views of the F-29 (Fokker)

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